

CLAIMS

## 1. An embolic protection device comprising:

5 a collapsible filter element for delivery through a vascular system of a patient;

the filter element comprising a collapsible filter body and a filter support frame contacting the filter body;

10 the collapsible filter body having an inlet end and an outlet end, the inlet end of the filter body having one or more inlet openings sized to allow blood and embolic material enter the filter body, the outlet end of the filter body having a plurality of outlet openings sized to allow through passage of blood but to retain undesired embolic material within the filter body;

15 the filter support frame having a longitudinal axis and being movable between a collapsed position for movement through the vascular system and an extended outwardly projecting position to support the filter body in the expanded position;

20 the frame having a plurality of engagement segments, the engagement segments being spaced-apart longitudinally and transversely when the filter is in the deployed expanded configuration to urge the filter body into apposition with the vessel wall.

25  
30 2. An embolic protection device as claimed in claim 1 wherein the engagement segments define at least one at least partially substantially helical engagement track.

- 20 -

- Amend Q1*
3. An embolic protection device as claimed in claim 1 or 2 wherein the frame comprises a number of frame elements, at least some of the frame elements having an engagement segment.

5

4. An embolic protection device as claimed in claim 3 wherein at least some of the frame elements are interconnected.

- Amend Q2*
5. An embolic protection device as claimed in any preceding claim wherein the frame has an intermediate section and a proximal section extending from the intermediate section, the engagement segments being provided in the intermediate section of the frame.

6. An embolic protection device as claimed in claim 5 wherein the proximal section of the frame extends radially inwardly of the intermediate section and defines at least one inlet hole to accommodate inflow of embolic material to be captured in the filter.

7. An embolic protection device as claimed in claim 6 wherein the proximal section of the frame has a proximal mounting for mounting on a filter carrier.

8. An embolic protection device as claimed in claim 7 wherein the proximal mounting is substantially tubular.

25

- Amend Q3*
9. An embolic protection device as claimed in any of claims 5 to 8 wherein the proximal mounting is offset with respect to the longitudinal axis of the support frame.

- 21 -

10. An embolic protection device as claimed in any of claims 5 to 9 wherein the proximal section of the frame is flexible with respect to the intermediate section of the frame.

5 11. An embolic protection device as claimed in claim 10 wherein the proximal section of the frame comprises a number of proximal elements, at least some of which are of a flexible material.

10 12. An embolic protection device as claimed in claim 11 wherein the proximal section of the frame comprises a plurality of flexible elements of relatively low column strength which are movable individually and independently of the intermediate section between taut and slack configuration.

15 13. An embolic protection device as claimed in claim 11, or 12 wherein the frame includes a distal section extending from the intermediate section, the distal section of the frame being flexible with respect to the intermediate section of the frame.

20 14. An embolic protection device as claimed in claim 13 wherein the distal section of the frame includes a plurality of flexible elements of relatively low column strength which are movable individually and independently of the intermediate section between taut and slack configurations.

25 15. An embolic protection device as claimed in any of claims 12 to 14 wherein the flexible elements are thread-like elements.

16. An embolic protection device as claimed in any of claims 12 to 15 wherein at least some of the flexible elements define tethers.

30 17. An embolic protection device as claimed in any of claims 5 to 16 wherein the frame has a distal section extending from the intermediate section.

- 22 -

18. An embolic protection device as claimed in claim 17 wherein the distal section of the frame extends radially inwardly of the intermediate section.

5 19. An embolic protection device as claimed in claim 18 wherein the distal section of the frame has a distal mounting for mounting on a filter carrier.

20. An embolic protection device as claimed in claim 19 wherein the distal mounting is substantially tubular.

10

21. An embolic protection device as claimed in any of claims 17 to 20 wherein the distal mounting is offset with respect to the longitudinal axis of the support frame.

15

22. An embolic protection device as claimed in any of claims 17 to 21 wherein the distal section of the frame is flexible with respect to the intermediate section of the frame.

20

23. An embolic protection device as claimed in any of claims 5 to 21 wherein at least the intermediate section of the support frame is formed from wire.

24. An embolic protection device as claimed in any of claims 5 to 21 wherein at least the intermediate section of the support frame is formed by a slotted tube.

25

25. An embolic protection device as claimed in any of claims 5 to 23 wherein at least the intermediate section of the support frame is an elastic, superelastic and/or a shaped memory material.

30

26. An embolic protection system as claimed in any of claims 5 to 25 wherein at least the intermediate section of the support frame is of Nitinol.

- 23 -

27. An embolic protection device as claimed in any of claims 3 to 26 wherein the included angle defined between adjacent frame elements is less than  $90^\circ$ .

5.

28. An embolic protection device as claimed in claim 27 wherein the included angle is less than  $60^\circ$ .

29. An embolic protection device as claimed in any of claims 3 to 28 wherein at least a portion of a support frame element is offset from the longitudinal axis by an angle of less than  $45^\circ$  in the expanded configuration.

30. An embolic device as claimed in any preceding claim wherein a support frame element is offset from the longitudinal axis by an angle of less than  $10^\circ$  when the frame is in the collapsed configuration.

31. An embolic protection device as claimed in claim 30 wherein a support frame element is offset from off the longitudinal axis by angles of less than  $5^\circ$  when the frame is in the collapsed configuration.

20

32. An embolic protection device as claimed in any preceding claim wherein the engagement segments are defined by segments of a single frame element.

25

33. An embolic protection device as claimed in claim 32 wherein the frame element is at least partially of helical shape.

34. An embolic protection device as claimed in any preceding claim wherein the collapsible filter body is mounted to the support frame.

30

- 24 -

35. An embolic protection device comprising:

a collapsible filter element for delivery through a vascular system of a patient;

the filter element comprising a collapsible filter body and a filter support frame contacting the filter body;

the collapsible filter body having an inlet end and an outlet end, the inlet end of the filter body having one or more inlet openings sized to allow blood and embolic material enter the filter body, the outlet end of the filter body having a plurality of outlet openings sized to allow through passage of blood but to retain undesired embolic material within the filter body;

the filter support frame having a longitudinal axis and being movable between a collapsed position for movement through the vascular system and an extended outwardly projecting position to support the filter body in the expanded position;

the frame having an intermediate section and a proximal section extending from the intermediate section; and

the proximal section of the frame being flexible with respect to the intermediate section of the frame.

36. An embolic protection device as claimed in claim 35 wherein the proximal section of the frame comprises a plurality of flexible elements of relatively low column strength which are movable individually and independently of the intermediate section between taut and slack configuration.

Amals  
Q10

37. An embolic protection device as claimed in claim 35 or 36 wherein the frame includes a distal section extending from the intermediate section, the distal section of the frame being flexible with respect to the intermediate section of the frame.

5

38. An embolic protection device as claimed in claim 37 wherein the distal section of the frame includes a plurality of flexible elements of relatively low column strength which are movable individually and independently of the intermediate section between taut and slack configurations.

10

*[Handwritten signature]*

*[Handwritten signature]*

39. An embolic protection device as claimed in any of claims 36 to 38 wherein the flexible elements are thread-like elements.

10  
15  
20  
25  
30  
35  
40  
45  
50  
55  
60  
65  
70  
75  
80  
85  
90  
95  
100  
105  
110  
115  
120  
125  
130  
135  
140  
145  
150  
155  
160  
165  
170  
175  
180  
185  
190  
195  
200  
205  
210  
215  
220  
225  
230  
235  
240  
245  
250  
255  
260  
265  
270  
275  
280  
285  
290  
295  
300  
305  
310  
315  
320  
325  
330  
335  
340  
345  
350  
355  
360  
365  
370  
375  
380  
385  
390  
395  
400  
405  
410  
415  
420  
425  
430  
435  
440  
445  
450  
455  
460  
465  
470  
475  
480  
485  
490  
495  
500  
505  
510  
515  
520  
525  
530  
535  
540  
545  
550  
555  
560  
565  
570  
575  
580  
585  
590  
595  
600  
605  
610  
615  
620  
625  
630  
635  
640  
645  
650  
655  
660  
665  
670  
675  
680  
685  
690  
695  
700  
705  
710  
715  
720  
725  
730  
735  
740  
745  
750  
755  
760  
765  
770  
775  
780  
785  
790  
795  
800  
805  
810  
815  
820  
825  
830  
835  
840  
845  
850  
855  
860  
865  
870  
875  
880  
885  
890  
895  
900  
905  
910  
915  
920  
925  
930  
935  
940  
945  
950  
955  
960  
965  
970  
975  
980  
985  
990  
995  
1000

40. An embolic protection device as claimed in any of claims 36 to 39 wherein at least some of the flexible elements define tethers.